

UNIVERSITY ENGINEERING EDUCATION AND TRAINING IN NIGERIA: DEVELOPMENT, WEAKNESSES AND IMPROVEMENTS

BY

ENGR. (DR.) G.U. OJIAKO
DEPARTMENT OF CIVIL ENGINEERING
UNIVERSITY OF NIGERIA, NSUKKA

ABSTRACT

The Nigerian University engineering education and training system is be-set by a number of inadequacies - low entry standards, non-uniformity in entry process for all engineering faculties in the country, moderate academic quality of entrants for the profession, low level knowledge of Mathematics and physical Sciences for the study of the profession, short and inadequate period of academic training in the university etc. Although the system is identical with that of the British, nationally there are social industrial and economic limitations mitigating against its effectiveness in producing engineering manpower of the right calibre. Consequently, the existing system is likely to produce mostly 'calculators' instead of engineers unless it is drastically modified.

A possible modification lies in the adoption of an enhanced entry requisite of a Combined Degree standard of knowledge of Mathematics and Physical science backed by well-organized industrial attachment during long vacations.

1. INTRODUCTION

Engineering is the profession of a highly talented few in any community. The word engineer is said to originate from "ingenious person" and the cleverness, the resourcefulness and the inventiveness implied in the word still remain the principal attributes of the profession. The complexity and the scope of the profession run parallel to those of various processes in the production of goods and services for human wants which all the fields of the profession - aeronautical, agricultural, chemical, civil, electrical, electronics, industrial, mechanical, metallurgical, nuclear, mining and petroleum, etc - progress steadily with a common objective to satisfy. Indeed, in the modern sense of the word civilisation and engineering may be said to be synonymous.

As events in developing countries move towards engineering manpower development for rapid acquisition of modern technology, it becomes certain that the prerequisite for acquiring the necessary professional skills rests squarely on its sound education and training. The effectiveness of the existing Nigerian engineering educational system in imparting the appropriate

skills required to develop the right calibre of technical manpower for the development needs of the nation, is doubtful. In this age which is so much dependent on technology, Nigeria should prepare to take the lead for the very highest engineering education and training standards that would enable her engineers not only perform creditably in the profession, but also keep abreast with the advancing technology.

This paper discusses the whole spectrum of our engineering education and training, pointing out their weaknesses and suggesting ways for improvements.

2. THE GROWTH OF ENGINEERING EDUCATION AND TRAINING IN NIGERIA

Up to the middle of this century, engineering and technical education for Nigerians was of the lowest priority in the educational system of the country.

Yaba Higher College established in 1930 as the first real institution of higher learning in the country was planned to provide a programme of higher education vocational training that would produce well-qualified assistants in engineering, medical and other vocational professions. A peculiar feature of this College, according to Fafunwa (1) was its

stringent entranced examination standard and high rate of drop-outs. Between 1930 and 1947 the total staff strength for all courses in the College was never greater than 13 nor less than 9 in any particular year. Engineering was taught by an engineer seconded from PWD and a building instructor. Total number of engineering assistants produced from 1934 to 1944 was nineteen and six surveyors.

As the country approached independence, both the Federal and the Regional Governments felt that there were overwhelming needs for establishment of Universities in the country to produce much needed technical and administrative manpower. This led to the creation of five universities within a decade following the independence in 1960 - University of Nigeria (1960), University College Ibadan becoming autonomous University of Ibadan (1962), Ahmadu Bello University Zaria (1962), University of Ife (1962), and University of Benin (1970). Now, twenty-five years after independence there are twenty-seven Federal and state owned universities in the country; more than half of them with faculties of engineering and/or technology.

Unfortunately, even with many universities and polytechnics existing in the country, the reality at the observation made by former Governor Dr. Isong in an opening address to Nigeria Society of Engineers, National Engineering Conference in Calabar on December, 1981: It would appear that the foreign component of the input in the design, construction, maintenance and management of these forms of engineering and technological systems (referring to those going on in Nigeria) is still far out of proportion to the expected indigenous contribution" - may well be with us for a very long time to come unless fundamental changes are effected in engineering education in the Nigerian University system.

3. ESSENTIAL FEATURES OF NIGERIAN ENGINEERING EDUCATION SYSTEM

Almost all Nigerian faculties of engineering operate a 4-year degree programme. A preliminary year of studies in physical sciences and the

Use of English exists for applicants who take the Joint Matriculation Examination (JME) and who possess the School Certificate (SC) or General Certificate of Education (GCE) Ordinary Level (O.L.) with passes at credit level in at least five subjects obtained at not more than two settings. For the direct entry into the 4-year programme, the minimum requirements are two passes at the principal or Advanced Level (A - Level) with SC/GCE 'O' Level credit passes in three other subjects at more than two sittings.

The English Language requirement is a pass and not credit level and an extra sitting is allowed for candidates to make up the English and/or mathematics requirement (according to General Entry Requirements - JOINT ADMISSIONS MATRICULATION BOARD (JAMB) brochure 1985 - 86 session.

The educational entry requirements for Colleges of Technology and polytechnics are much lower than those for Universities.

Theoretical work in universities follows the British pattern of concentration of lectures on the engineering theory and underlying scientific analysis during the academic sessions. In the final year, the student may specialise in one or two areas of his discipline by choice of optional subjects. There is little or no provision for some on-the-course practical experience during the University work.

Student assessment process of sessional and final degree examinations are all identical with those in British Universities. The only notable exception may be that of the University of Nigeria, Nsukka, which operates the traditional USA cumulative grade point average system. In both cases, nevertheless, the examinations are internally set, conducted, marked and assessed by the very lecturers who teach the courses. An external examiner may moderate the final year degree papers of a Department of the Faculty.

The academic programme, the examination and the training processes in the country's Technical Institutes and Colleges of Technology are carbon copies of their British counter-parts. Thus the Nigerian Ordinary National Diploma (OND) and

Higher National Diploma (HND) are presumably of the same standard as those of their British equivalent.

It is now apparent why many concerned industrialists find it difficult to appreciate the very slow progress by Nigerian technicians in technological acquisition. After all, the British engineers and technicians make and sustain their advances in technology on similar standards of education and training.

But it has to be recognised that any educational system tailored to fit an advanced nation may not produce the same effects in a developing country, which may have several limitations including little technological background. Therefore, neither the British engineering training system, nor that of the USA or indeed that of any advanced nation, would really produce Nigerians with technological competence capable of transforming Nigeria into a manufacturing nation and an exporter of technological know-how. Nigeria needs her own engineering education and training system designed with due considerations for her background and social limitations and in consonance with her national objectives, if an accelerated technological leap is to be made.

4. NATIONAL LIMITATIONS AGAINST ADOPTION OF FOREIGN TRAINING SYSTEM

The medium of instruction in engineering, like in other disciplines taught in higher institutions of learning in Nigeria, is English which is a foreign language for the masses of the students. In general, proficiency in the language has declined considerably among students since independence.

Historically, as has been discussed in section 2, engineering education and training are relatively new in the country about thirty years old only. The nation has therefore, little of modern technological background upon which any inherited foreign related education system may thrive.

Nigerian financial capability is very limited to equip adequately and to maintain a high standard of the

many universities and technical institutions hastily established unplanned. The limited funding implies that Universities and Technical Institutions, can only provide:

- (a) Limited Library facilities - fewer textbooks, reference books, scientific and engineering journal, library and inter-library services etc.
- (b) Limited postgraduate and post-doctoral research grants or facilities.
- (c) Ill-equipped laboratories and/or attached industrial units.
- (d) Under-staffed courses.

But the universities are fairly distributed throughout the states in the country necessary to foster the much needed unity of Nigeria, and to correct imbalances in inter-state and intra-state developments. According to the National policy on Education (2), not only is education the greatest force that can be used to bring about redress in the imbalances, it is also the greatest investment that the nation can make for the quick development of its economic, political, sociological and human resources. The limiting effect of the fact of this policy here is that if universities are established in places and at any time for mere political expediency, then it is natural that the excellence of the prime function of the university would have to be compromised somehow, sometimes, somewhere; and this danger would reflect more on engineering and science education than on any other discipline.

Nigeria is an underdeveloped and unindustrialised nation with only few small-scale industries and negligible large ones. Most of these industries may be categorised as "non-growth" industries in the sense that they are not of the type of industries producing electronics, computers, chemicals, pharmaceuticals, instrumentation, automation etc. which depend on the exploitation of new developments and advances of knowledge in science and technologies. Thus, Nigerian engineering students have limited opportunities for on-the-job experience of being exposed to real technological development as they are

available to their counterpart in developed countries.

5. ANALYSIS OF WEAKNESSES IN THE EXISTING UNIVERSITY ENGINEERING EDUCATIONS SYSTEM

The weaknesses include: Low entry standard; non-uniform entry process and or standard for all engineering faculties in the country's universities, moderate academic quality of entrants for the profession, low level knowledge of mathematics and physical sciences for the profession, short and inadequate period of academic training, little postgraduate and research activities, poor awareness and limited provision for continuing engineering education facilities and inefficient management of organised on-the-course industrial training.

5.1 LOW ENTRY STANDARD

Nearly all the entrants into Nigerian universities for degrees in engineering are finalists of secondary schools who have little or no idea of what the profession is all about. The standards of SC and GCE O. level are low and the provision that the five subjects have to be passed at not more than two sittings has further weakened the entry level requirements, for it enabled weak students to take the examination several times and then combine any two results that satisfy the requirements. For the direct entry candidates, the stipulation of two A - level science subjects obtained at more than one sitting has created a loophole for the admission of weak candidates since there is no limit to the period of time interval for the two subjects to be passed.

The English Language presents the weakest point in the standard of entrants into the professional studies in the University. Although the mere pass O' level standard is usually improved by courses in the Use of English in the preliminary year in the University, yet the weakness often persists throughout the degree period.

5.2 DIFFERENT UNIVERSITY ADMISSION PROCESSES FOR ENGINEERING

For a national university system to be recognised for its quality and

worth, must have uniform standards for its entry and degree awards. The Nigerian University system (NUS) has come to stay. This came about, as observed by Ajayi (3) with the central control of admissions through the JAMB, the financial control through the National Universities Council (NUC), and the establishment, under National Policy on Education, of higher education institutions throughout the country as a unifying force and for setting national goals. While the writer sees the real need for the establishment of federally financed chain of school of basic studies in some areas of the country to reduce the imbalances in higher educational development, the dangers of non-uniform admission standards to the NUS can never be overemphasized particularly where the leading of science and engineering is concerned. The degree standards of these courses anytime anywhere in the country should not be compromised for expediency. This has to be stressed because students in the schools of basic studies are exclusively examined internally and offered admissions to universities in particular areas of the country. There has been no real attempt to encourage and stimulate their interest in open competition with the rest of their country school children taking the JME or GCE A. level. The existence of the Interim Joint, Matriculation conducted by Ahmadu Bello University for direct admissions into some Universities in the north only should be reviewed.

On the general varying and lowering of entry standards, Akinkugbe (4) has this to say: "The rapid" expansion in quantity of universities (in Nigeria) has serious adverse effects on the quality of scholarship and application has been compromised. Academic programmes have been rethought, curricula reshaped and instructional methods improved to meet the challenge of numbers but the deficiencies persist in many instances. The inadequate preparation of students entering the system, the emergence of schools of basic studies, the lowering of preliminary Entry, requirements, Remedial progress - all have a telling effect on the quality of the end products.

Any view substantially

different from these remarks against the dangers to NUS by the lowering and varying standards of entry are not realistic.

5.3 MODERATE NUMBER OF ENGINEERING ENTRANTS WITH HIGH ACADEMIC QUALITY

Figures of JME results of five consecutive years for the Faculty of Engineering, University of Nigeria, Nsukka, shown in table 1 has revealed a depressing trend of the decreasing number of good quality brains seeking admission into the Faculty.

The trends revealed for the University are assumed to be similar for all universities in the country to justify the inferences made from the table.

The table shows that for all faculties the number of BB has been decreasing since 1981. The number of BB each year for medicine exceeds those for engineering, physical and biological sciences lumped together. Engineering shares an average of about 15% of BB but this figure may be misleading because the figures for some faculties like Business Administration and environmental Studies were unavailable to be included in the table. A better estimate of the share should be about 10%.

Attraction of few BB and admissible candidates to the profession may be due to a number of reasons - poorly equipped science laboratory facilities, in secondary schools, unimaginative teaching of mathematics and science in the schools and/or lack of dedication on the part of science teachers. It may also mean that because engineers often fight shy of publicity for their amazing feats of numerous activities the profession has incurred low public prestige unattractive to young generations. The Governments and Nigerian Society of Engineers should view the situation seriously as a challenge to their careers departments. Post-primary schools should from time to time be inundated with career booklets in engineering illustrating various activities in the profession and their contributions to civilization and in the modernisation processes of the country. Whatever

the cause, the current swing away from science, technology and engineering of the best brains among potential university undergraduates in secondary schools jeopardizes the future quality of the entrants. It also exposes the inadequacies of the present National Policy on Secondary Education which is supposed to be oriented towards producing more scientific minded candidates.

5.4 POOR BACKGROUND KNOWLEDGE OF MATHEMATICS AND SCIENCES

Engineering may be seen as the profession in which a knowledge of mathematical and natural sciences is judiciously and economically applied to materials and forces of nature for the benefit-of mankind. It is therefore obvious that the acquisition of the skills of the profession is a function of the degree of mastery of the physical sciences.

The levels of knowledge of these subjects in the study of engineering are about those of Advanced Level of the GCE and the knowledge may be acquired before entry into the University in the case of direct entry candidates or in the preliminary and second years of study for those who gain admission by JME. In any case, as rightly observed by Henry (5), "Standards are regrettably even low at A level for entry qualifications for university". Hence A Level of the GCE in Mathematics, Physics and Chemistry is not sufficiently high a standard for the modern demands of graduate engineering education.

5.5 SHORT AND INADEQUATE PERIOD OF ACADEMIC EDUCATION FOR THE PROFESSION

The 4-year period of engineering programmes in Universities in Nigeria is modelled on the American - British traditional system of keeping students in the university for a short time compared with all other European countries. The system relies heavily on on-the-job training in the industry which is more likely to lead to superficial acquaintance rather than through understanding of the underlying scientific principles in the method of engineering solutions to problems. The Americans themselves

recognised these limitations. engineering education in the USA
 According to Garrelts (6) the Goals reported that
 Committee set up in 1961 to
 investigate the whole system of

FACULTIES	ACADEMIC YEAR				
	1981	1982	1983	1984	1985
Engineering	96 (1017)	25 (527)	15 (546)	10 (468)	11 (332)
Physical science	5 (138)	3 (75)	1 (108)	1 (76)	1 (101)
Biological science	3 (101)	3 (87)	2 (128)	3 (96)	0 (74)
Medicine	163 (1661)	32 (1089)	57 (1474)	41 (1024)	39 (1071)
Arts	96 (2128)	9 (1439)	7 (1485)	5 (1399)	4 (612)
Law	300 (3909)	23 (2448)	15 (2185)	26 (2024)	26 (1827)
Social science	47 (1343)	3 (1094)	1 (1522)	7 (1142)	3 (898)
%share of Engineering of BB	13.3	25.1	15.1	10.7	14.9

Table 1 - 'Best Brains' (BB) and 'Admissible Candidates' for UNN in JME 1981-85

BB - Candidates passing with 290 arts or above out of 440 maximum possible total marks obtainable.

Admissible Candidates (numbers in brackets) - ones with total marks of 200 and above.

four years' basic engineering training was too little for many areas and functions of the profession.

A longer period of study for engineering degree affords the university enough opportunity to provide undergraduate students the widest possible view of events in their areas of studies. This may include provision of courses on financial consideration and points of law affecting designs, professional activities and the environment. In the present Nigerian engineering educational systems, it is not possible to include similar courses, because syllabuses are already overburdened in trying to provide many courses within the short period of the degree courses. Any further additions of courses to existing curricular must be matched by deletions.

Hence, an appropriate engineering degree programme for a developing country like Nigeria must have to be of a longer duration than the present 4-year programme if it is to produce engineers of good broad education, capable of basic thought well endowed with the humanities.

5.6 LITTLE POSTGRADUATE AND RESEARCH ACTIVITIES

All progress in engineering, ultimately, depends on scientific research which may be based in industries, research and institutes and universities. Research work in engineering constitutes source of advanced learning in which the students knowledge of science and engineering principles is applied to practical problems and utilisation.

Two aspects of scientific research concern the engineer. Firstly, there are fundamental and applied research which provide the engineer with new materials and techniques and with new applications of known principles. Secondly, there are huge research instruments which have to be designed and built by engineers to facilitate continued scientific investigations.

In Nigeria, both the engineering teaching staff of universities and their postgraduate students have for some reasons, very limited opportunities for the types of

research work they have desire to undertake. The foremost of these reasons are scarce facilities and funding. The limited opportunities for research should be of national concern because one or two nationally and internationally recognised personalities in engineering research can do a very great deal by their achievements to enhance the reputation of engineering and its national education system in the eyes of their fellow countrymen and those abroad.

5.7 POOR AWARENESS AND LIMITED PROVISION OF CONTINUING ENGINEERING FACILITIES AND EDUCATION

An engineer even if endowed with the best of engineering education and training must constantly study if he is to continue to be a contribution to the progress of the ever changing technological developments.

In Nigeria, as in many developing countries, universities are understaffed and poorly equipped. The development and provision of courses for continuing engineering studies are limited indeed. In addition, the few courses often offered by some universities are usually undertaken with poor response from Government ministries and parastatals, public and private firms and industries, for sponsored candidates.

The little awareness of the importance of continuing engineering education studies as well as the near complete absence of their programmes and facilities in most universities in the country have posed a serious pitfall on the updating, diversifying and broadening aspects of our engineering education system. In particular, they place severe limits to the specific enhancement of the competence of the individual as a practicing engineer.

5.8 PROVISION OF ON-THE COURSE INDUSTRIAL EXPERIENCE

Most engineering programmes in Nigeria Universities are full-time in the sense that students spend nine months in academic work (in three terms or two semesters) followed by a long variation of two to three months. Since the establishment of Industrial Training

Fund (ITF) and Students Industrial and work Experience Scheme (SIWES), by the Federal Government, industrial attachment for undergraduates during the long vacation has provided unique opportunity by which most young engineers are able to see for themselves whilst still in the university, how their profession is organised.

A problem of industrial training is that engineering activities are many and varied and training needed includes design and manual skill and everything in between. In any engineering education system the practical side of the undergraduate training is often not as clearly defined as in the case of his academic training. Generally this training, particularly during the long vacation, has no control and its success depends upon the quality of effort and observations of the student. Any gain in correct experiences during the long vacation depends on chance and not contrived out the training of the young engineer must not be left to chance.

There is still scope to evolve a better national pattern of supervised industrial training during long vacations at both undergraduate and post graduate levels than the existing ineffective, working understanding between the ITF and SIWES of engineering faculties. The Nigerian Society of Engineers should address itself to this task and propose some form of recognition for training during the long vacation that will be admitted by the Society as part of the professional period of training.

6. COMMON NATIONAL EXAMINATION SYSTEM FOR ENGINEERING DEGREE

An introduction of a common engineering degree examination will not only give the country a unique engineering education system evolved in Nigeria for its own needs but will also constitute a worldwide imaginative innovation. With this system students will be stimulated to harder studies, the teaching staff will be more dedicated to their work and the results will continually provide the Senate of each university involved in the

system with data and inspiration for special considerations of the needs of its faculty of engineering.

The common degree examination would not constitute an infringement of the university autonomy just as Joint matriculation Examination does not. All universities will be involved in the setting and grading the examinations and their results. External examiners for undergraduate degrees will no longer be required. 20th students mobility and teaching staff exchangeability among various universities will be facilitated without being affected by any serious differences in curricula of the universities, thereby fulfilling a philosophy of the Nigerian education policy of bringing about the integration of the individual into a sound and effective citizen inside the national university system.

7. AN APPROPRIATE UNIVERSITY ENGINEERING EDUCATION

Nigeria needs a radical programme of university engineering education if the weaknesses and inadequacies discussed in section 5 and their possible consequences to the society are to be avoided. A curriculum based on a 4-year Honours Degree in Combined Applied Mathematics and basic Sciences as a prerequisite for reading a degree course in Engineering should be introduced. This proposal may be regarded as the centre piece of this article.

The stipulation of Applied Mathematics instead of Mathematics is to emphasize that topics on Abstract Mathematics are to be excluded for their little relevance to the solutions of engineering problems. Emphasis should be on common mathematical and statistical principles in engineering and technology which may include introductory courses in fluid mechanics, strength of materials etc.

The engineering degree course itself should be a five-year programme, preferably in an Engineering school, in which the first year consists mainly of introductory courses on basic principles of all disciplines in the particular Faculty of Engineering the

degree is being undertaken. This will enable the students decide finally on their motivated discipline of engineering to do in the degree. The three years following should be concentrated on the departmental courses of the chosen discipline and the last year devoted to the student's area of specialization.

It is suggested that students in all Engineering Schools and Faculties of Engineering in universities all over the country should have the same examinations at all stages of the degree programme to maintain common excellence of the degree and its standard. A high standard, of medical training in west Germany is maintained on lines of these common examinations at all stages for all universities. Other features of the proposed degree programme including recommended degree titles are shown in Flow Chart A.

7.1 SOME IMMEDIATE BENEFITS OF THE PROPOSED SYSTEM

- (a) Most of the inadequacies of the existing engineering education system already discussed will be eliminated giving Nigeria special advantage over some advanced countries in the standard of engineering education. This advantage is essential for Nigerian acquisition of their advancing technology.
- (b) By involving the students in the Applied Mathematics/Sciences degree course in SIWES in long vacations, the young engineer aspirants would have become exposed to the exact nature of various engineering disciplines by the time the degree is taken so that their choice of fields of engineering studies later is by motivation unlike what is obtainable today with many students registering for engineering disciplines they have no idea of the nature but merely to get them into the university.
- (c) The programme advocated would provide an opportunity for covering a whole spectrum of an ideal engineer's training - the need towards a broader based education with simultaneous exposure to the practice in the industry and finally followed by intense specialization.
- (d) Since there is the real danger that many of the present engineer graduates would sooner or later prove to be merely 'calculators', the strong degree entry background would provide perfect springboard from which creative, imaginative and courageous engineering designers of distinction will begin to emerge in satisfactory large numbers.
- (e) Engineers of the new programme would have mastery of basic sciences and possess good mathematical tools essential for high-level individual or collective research in pursuit for new technological developments.
- (f) The Mathematics/Sciences degree requisite for engineering may bring about new awareness of the importance of and then revive interest in Mathematics and Sciences among secondary school children and their tutors. The present enrollment figures for degree courses in almost all the departments of the Faculty of Physical Sciences are dangerously low for an ambitious developing nation as Nigeria.
- (g) With the introduction of 6-3-3-4 system, it is obvious that many Nigerian children will finish their secondary school education and enter the University about the age of 17 or 18. The proposed engineering degree programme of nine years duration Plus an additional year of practical experience in the industry to become registrable with COREN implies that the completion at the engineering training will become attainable at the age of 27 or 28 and this is about the age our children attain full maturity and have a feeling of independent existence from their parents. Compared with the average age range of 27 - 28.5 years (7) for British young engineers passing professional examinations and interviews of the Institution of Civil Engineers, there is not much loss of the time for their input or contribution in the development of the society.

the same problem of a flood of knowledge insisted that all young doctors should have a minimum of six years non-specialist training and a further three years Of broad training in either medicine or surgery - a total of nine years for specialisation.

- (b) Because of the lengthened period in the University for qualification only fewer students may be attracted to the University Engineering degree studies. But this may be an advantage. Russia has shown that to develop rapidly, a large number of well-trained technicians, guided by a small number of highly educated engineers is all that is needed.
- (c) The proposed programme, like any approved new university programme or an extended old one would require certain additional financial input from the NUC for provision of staff, space and other faculties. However, with careful planning involving phasing out of the existing system and concentrating on three to four universities with the proposed programme, any additional cost above that of the existing system may be Marginal.

8. CONCLUSIONS

There are many weaknesses in our university engineering education system. To acquire rapidly the much needed modern technology, there is an urgent need for a radical approach in the development of engineering education system in the country. This article calls for an introduction of a curriculum based on a 4-year honours Degree in Combined Applied Mathematics and Basic Sciences as entry requirement for a 5-year degree course in engineering; a common examination system for all stages of the engineering course, and a well-coordinated SIWES programme during the courses. The advantages of the entire programme will heavily outweigh its disadvantages.

By answering this call, by breeding brilliant men and women of engineering motivation and inquiring minds and by giving them opportunities in industries research establishments and on sites to engage their knowledge, creative ability and initiative, Nigeria will be transformed economically, socially and militarily not with imported technology and weapons but with those

of her make. There would no longer be the need to lament over the level of Nigerian advance in technological acquisition. The world would automatically appreciate her engineers in their own rights.

9. REFERENCES

1. Fafunwa A.B. (1971) "A History of Nigerian Higher Education" MacMillian & Co. (Nig.)
2. Federal Republic of Nigeria (1981): "National Policy on Education Revised" Federal Government Press, Lagos.
3. Ajayi J.F .,A. (1983) "Planning and Co-ordination in a Federal System, The Education of the Nigerian University System" Twenty Year of University Education in Nigeria, - edited by Chizea C.A. and published by NUC P. 17.
4. Akinkugbe, O. O. (1983) - "Random Thoughts on the Emerging Nigeria University" Twenty Year of University Education in Nigeria - p. 59, Edited by Chizea C.A. and published by NUC.
5. Henry T. (1982): discussion on paper "The Future of University Education in Civil Engineering, by P.C .G. Isaac". Future needs in Civil engineering education proceedings of the conference on civil engineering education and training organized by ICE and held at the University of Birmingham on 15-16 Sept. 1981, p. 63. Published by Thomas Telford Ltd., London.
6. Garrelts J.M. (1968): "The training of Civil Engineers today in the USA". An Oral Report given at the Conference on education and training of Civil Engineers - held at Queen Elizabeth College, University of London 16-22 Sept. 1968 and reported in ICE Proceeding of Vol. 42 Jan. 1969 p. 153 - 168.
7. Begbie D.L.G. (1981) "The Professional Examination: present and future" Proceedings of the Conference on Civil engineering education and training organized by the institution of Civil Engineering and held at the University of Birmigham on 15-16 September 1981. Published by Thomas Telford Ltd